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CLAIMS

1. A method of generating a signature implemented over an elliptic curve public
2 key encryption scheme utilizing information maintained secret in one computing device
comprising the steps of:

4 i) initiating the computation of a coordinate a point on the elliptic curve
from a pair of other points on said curve by performing on said one device an initial set of
6 sufficient steps in the computation to inhibit recognition of information pertaining to the
identity of said other points;

8 ii) transferring to another computing device remote from the one device
the results of said steps;

10 iii) performing at least such additional steps in said computation at said
other device to permit the completion of said computation at said one device; and

12 iv) transferring the result of said additional steps to said one device for
incorporation in said signature.

2. A method according to claim 1 wherein said initial steps includes a field
2 operation to combine information from each of said other points.

3. A method according to claim 2 wherein said combined information is utilized

2 in said additional steps.

4. A method according to claim 3 wherein said field operation includes the
2 summation of the information representing one coordinate of each of said other points and
the summation of the information representing the other coordinate of each of the other
4 points.

5. A method according to claim 1 wherein said additional steps complete said
2 computation.

6. A method according to claim 4 wherein said information representing the
2 summation of said coordinates is transferred from said one device to said other device.

7. A method according to claim 4 wherein said elliptic curve is over the finite
2 field 2^m and represents said coordinates in a normal basis in said field.

8. A method according to claim 7 wherein said additional steps includes
2 cyclically shifting said information representing the summation of said coordinates.

9. A method according to claim 1 wherein said computation generates a single
2 coordinate of said point, said single coordinates being utilized in said signing.

10. A method of deriving a coordinate of a point on an anomalous elliptic curve

over the field $GF(2^m)$ for utilization in a public key encryption scheme implemented on said curve, said method comprising the steps of:

i) storing a normal basis representation of each of a set of coordinates of points on said curve;

ii) retrieving said normal basis representation of a coordinate of one of said points;

iii) performing an i -fold cyclic shift on said retrieved normal basis representation of said one coordinate; and

iv) utilizing the resultant representation as a coordinate of a further point on the curve resulting from an i -fold application of the Frobenius Operation to said one point.

11. A method according to claim 10 wherein each of said set of coordinates

represents a point on the curve that is an integer multiple k , of a starting point P , and the i -

fold application of the Frobenius Operation to said starting point P produces a new point $\phi^i P$

where $\phi^i P = \lambda^i P$;

said method including the step of determining the integer k' associated with

said further point by computer $k\lambda^i$.

12. A method of generating a session pair k, kP for use in a digital signature

2 performed on an anomalous elliptic curve in the field $GF(2^m)$ where kP is a point on said curve resulting from the k fold addition of a starting point P where k is an integer, said method

4 comprising the steps of:

- i) storing a set of initial values of k and kP , as a normal basis

6 representation in the field $GF(2^m)$;

- ii) selecting a coordinate of one of said points kP in said set of initial

8 values;

- iii) performing an i -fold cyclic shift on said coordinate to obtain a normal

10 basis representation of the coordinate after an i -fold application of a Frobenius Operation;

- iv) selecting the integer k associated with said one of said points;

12 v) computing an integer value $\lambda^i k$ where λ defines the relationship

between the start point P and a point ϕP and ϕ indicates a Frobenius Operation;

14 vi) utilizing the resultant representation of the coordinate and the value $\lambda^i k$

as a session pair in a digital signature r, s where r is derived from the representation of a

16 coordinate of a point on the curve and s is derived from the integer value associated with such point, the message to be signed and r .

13. A method of generating signature components for use in a digital signature

2 scheme, said signature components including private information and a public key derived

from said private information, said method comprising the steps of storing private
4 information and related public key as an element in a set of such elements; cycling in a
deterministic but unpredictable manner through said set to select at least one element of said
6 set without repetition and utilizing said one element to derive a signature component in said
digital signature scheme.

14. A method according to claim 13 wherein a pair of said elements are selected
2 from said set and said pair of elements combined to provide said signature components.

15. A method according to claim 14 wherein said value selected pair of elements
2 is operated upon to produce private information and a public key derived from said one
element prior to combination with the other of said elements.

16. A method according to claim 15 wherein a computation to combine said
2 elements is initiated on one computing device and sufficient steps of said computation are
performed on said one device to inhibit recognition of information in said elements and
4 subsequent steps are performed on another computing device after transfer of a partially
completed computation thereto.

17. A method according to claim 14 wherein said pairs of elements are selected by
2 generating a pair of indices indicating respective locations of said elements in said set.

18. A method according to claim 17 wherein said indices are obtained from an
2 ordered array arranged to provide each possible combination of indices.

19. A method according to claim 18 wherein said indices are selected from a
2 counter that increments with each signature.

20. A method according to claim 19 wherein output from said counter is modified
2 to provide a non-sequential selection of said indices.